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Why some clusters succeed whereas others decline ? Modelling the ambivalent stability properties of clusters

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Modeling the ambivalent stability properties of clusters
Why some clusters succeed whereas others decline?*

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ABSTRACT

The aim of this paper is to study the ambivalent properties of stabilities of clusters. We propose to enter the black box of the local knowledge externalities by focusing on the location decision externalities. In particular, we show that the nature of mimetic strategies in the convergence process of locational choices influence the dynamic stability of clusters. Thus, when uncertainty and search for legitimacy prevail on the need for coordination and the associated necessities of compatibility and technological convergence, the clusters are unstable, due to an excess of cognitive proximity and a risk of unintended spillovers. Nevertheless, this search for legitimacy, through the strategy which consists in following the locational choice of companies leader of a sector, can lead to the fast emergence of a cluster. But without relational proximity, its stability is not insured.

These results are obtained following the formulation of some theoretical proposals on the links between location decision externalities and the resulting forms of socioeconomic proximities. This set of proposals is validated firstly by a model of simulation which makes it possible to test the properties of stability of aggregate outcomes of locational choices. Secondly, they are illustrated by a comparative empirical analysis of two main French clusters (Silicon Sentier and Sophia-Antipolis).

KEYWORDS

clusters, proximities, stability, location under decision externalities, Silicon Sentier, Sophia-Antipolis

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1. INTRODUCTION: PROXIMITIES AND CLUSTERS

Innovative clusters have received a growing attention around the role they played in the knowledge-based economy. One of the most convincing explanations papers generally provide refers to the geographically bounded dimension of knowledge spillovers. Local knowledge spillovers studies are particularly well-suited to explain the causal relations between existing agglomerations of activities and aggregate performance at regional level, but they are less relevant to explain the reasons of why activities locate close together and why some clusters succeed whereas others decline. One of the most promising entries to understand the performance of clusters is to link the cumulative process of location to the relational dimension of clusters. The weight of knowledge externalities and the aggregate performance of clusters have to be associated to their relational structure. The reasons of why technical knowledge exchange have a strong local dimension compared to global one have to be better founded in the "story" of co-location processes rather than a functional decomposition between tacit and codified knowledge. Several works have recently formulated some critics on the local dimension of knowledge spillovers (Breschi & Lissoni, 2001) and on the geographical proximity as a basic source of innovation and competitiveness (Boschma, 2005).

To go beyond these critics, the basic idea of the paper is to show that the intrinsic performance of clusters cannot be analysed without focusing on the relational – or organizational – dimension of clusters, as in sociological approaches (Uzzi, 1997), whereas the relational structure cannot be understood without focusing on the dynamical mechanisms of interaction at work in the clustering process. We refer to the sequential process of location and the nature of interdependencies in location decision making (Vicente, Suire, 2006).

The first part develops these general considerations by surveying the structural properties of clusters through a typology of proximity relations, and through a set of propositions linking sequential processes of location and relational structures of clusters. Imitation as a rational behavior (Bikhchandani & alii, 1998, Hedström, 1998, Orléan, 2002) is at the centre of our analysis as one of the most promising entries to understand the emergence of locational norms. We show that the motivations for agents to imitate others are intrinsically linked to the emergent form of socio-economic proximity at work in clusters. The second part tests these propositions in a simple model of locational norms in order to discuss the stability properties of clusters. We show that the intrinsic stability of clusters can differ strongly according to the type of mimetic process of co-location, the associated form of proximity and the role played by some so-called "fashion leaders". Last part gives some illustrations on ICT clusters in France, focusing on sequential processes of co-location and on the type of socio-economic proximity in two specific clusters – Silicon Sentier and Sophia Antopolis (Dalla Pria, 2005) – which have exhibited different properties of stability after the aftermath of Internet bubble and crash.

2. PROXIMITIES, IMITATION AND CLUSTERS

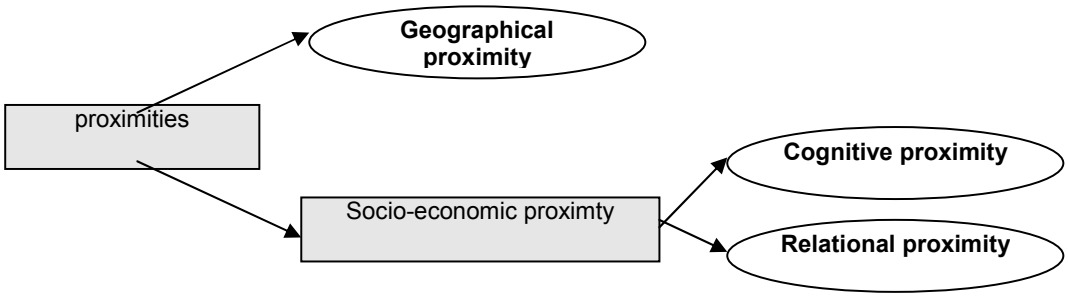
2.1. back to proximities

The idiosyncratic and polymorphic concept of proximity has been developed by economists, sociologists and geographers in order to enter the black box of local externalities (Torre and Gilly, 2000, Pecqueur and Zimmermann, 2004, Boschma, 2005). They have focused on the organizational and institutional dimensions of places, industrial agglomerations or innovative "milieux". Different categorizations of proximities have been tested, and the common denominator of all of there lies in the fact that the geographical proximity is not a sufficient condition for the performance or the coherence of industrial agglomerations. Others dimensions matter, such as cognitive, technological, social, institutional or some complex combinations of all them.

All of these works have permitted to develop and enrich the traditional analysis of different types of industrial agglomerations. Nevertheless, one of the main perspectives of research on proximities has to stress on a clear conceptualization linked to tractable measurement tools. On this prospect, following Bouba Olga

and Grossetti (2005), we propose in this paper to define three dimensions of proximities (plus an embracing forth one), with some prospects on the ways to measure each of there in empirical analysis[1].

Figure 1. A typology of proximities



The geographical proximity can be summarized following the works of Torre and Gilly (2000) and Boschma (2005). It refers to the distance which separates agents (individuals or organizations) and can be measured by distance and cost indicators such as miles or transportations costs, or more simply, as we do later, by supposing binary situations: we are close each other or not. The socio-economic proximity is defined in a voluntary general way, in order to clearly distinguish the geographical dimension from other dimensions. It has to been decomposed into two categories. The first one is the cognitive proximity. It refers to the behaviors and knowledge of agents. Agents are cognitively close each other when they share some conventions and a whole of common values and representations. This cognitive proximity refers to knowledge and technological capabilities, as in Boschma approach, but either on managerial practices, discourses, economic actions and so on. One of the tools that has to be used to identify cognitive proximity, besides knowledge and technological capabilities, is the analysis of discourses and practices of agents through interviews and an *ex post* sort of "pinpointing" which consists to isolate some proximities in behaviors, some routinized behaviors as the so-called "taken for granted" that the sociologist Goffman (1973) recognizes in the construction of collective identities. The second one is the relational proximity. It refers to the basic notion of interaction and structure. Individuals or organizations such as firms are close each other in a relational sense when they share a same interaction structure, make transactions or realize exchanges. The fact that agents are cognitively close each other does not necessarily means that they are in interaction (or simply that they have the possibility to communicate). For that, we must identify a communication or an interaction structure. Relational proximity can present several dimensions: agents can be relied directly or indirectly through intermediaries, interactions can be strong and frequent or weak and scarce, interactions can be purely cooperative and horizontal or hierarchical and vertical. What does matter is that an intensity of interaction and communication can be identified in order to measure a degree of relational proximity. For that, several qualitative and quantitative tools are available to construct relational databases: firm networks, financial relations, joint ventures or other agreements, co-patents and co-publications (Audretsch and Feldman, 1996), but either social networks such as friendship or scholarship past relations. It's important to notice that cognitive proximity and relational proximity are not exclusive one from the other. At the opposite, they are intrinsically linked but operate at two different levels. The first one concerns the behavioral dimension of proximity, through the characteristics of agents, whether the second one refers to the interaction and communication structure linking (or not) agents.

Industrial clusters or agglomerations can be analyzed, in a *static sense*, through such a typology, according to the complex combination of these three types of proximity, particularly according to the respective weight of the two latter. But in this paper, we try to go far by analyzing, in a *dynamic sense*, the process by which these proximities emerge, particularly through a sequential process based on location decision interdependences and externalities.

[1]For a discussion on the respective typologies of Torre and Gilly (2000), Boschma (2005) and Bouba Olga and Grossetti (2005), see Vicente, Dalla Pria and Suire (2005)

2.2 Rational imitation in economics and sociology: uncertainty, legitimacy and coordination

Why agents converge in location decision making (geographical proximity) and how this convergence process can give rise to the other types of proximities over-discussed? Several explanations on the reasons of why firms converge in same locations have been furnished in the field of the "new economic geography". Strategic interactions, transactions costs reduction and increasing returns in an imperfect competition context appear generally as strong forces of agglomeration. Nevertheless, in spite of the robustness of these approaches, they reveal some inadequacies in the explanations they provide on the other proximities. By dismissing interactions other than pure market ones, they put aside all other social interaction mechanisms giving rise to convergence in organizational and managerial practices, knowledge capabilities or local networks. All of these mechanisms are identified in the literature as playing a critical role in the clustering processes, particularly in the clusters of the so-called "weightless economy" (Quah, 2000), in which intangible goods reduce the weight of transportation costs.

To overpass these limits, one of the most promising social interactions mechanisms for interpreting such a convergence process centres on the role played by mimetic behaviours and decision externalities. Social interactions based on mimetic behaviours have been the subject of a growing literature in economics (Banerjee, 1990; Bikhchandani & alii, 1992, 1998; Manski, 2000; Orléan, 2001), but also in sociology (Granovetter, 1978; DiMaggio and Powell, 1983; Hedström, 1998; Strang and Macy, 2001; Watts, 2006). All of these literature exhibits some common denominators. In a general point of view, each of them, sometimes referring to Schelling works, tries to analyse interaction mechanisms playing between heterogeneous and rational individuals and aggregate outcomes, such as norms or conventions, through the concept of mimetic behaviours or interactions. The basic idea is that interactions are always sequential. This assumption is crucial for at least one reason. It permits to introduce in the interaction mechanisms the possibility for agents to observe the decision of others, and more generally to enter the black box of decision externalities leading to cumulative processes.

We can distinguish different motives for agents to adopt mimetic behaviours or to converge to same decision, each of them engendering different properties of aggregate outcomes in terms of stability of collective behaviors.

Table 1. individual motives for imitative behavior and aggregate outcomes

	Common assumptions and basic principles	**Uncertainty**	**Legitimacy**	**Coordination and compatibility**	**Evolving pay-off, stability and fragility**
Arthur (1989)	Rationality, heterogeneity, sequentiality and cumulation			Network externalities, interaction and co-operation	Increasing return to adoption, and stability
Bikhchandani & alii (1992, 1998)		Balance between private signal and public information of predecessors	The role of "fashion leaders"		Intrinsic fragility sensitive to external shocks
DiMaggio & Powell (1983)		Emergence of organizational fields	Following leaders in organizational fields	Professional networks	
Hedström (1998)			Do not be marginalized in communities		Self-fulfilling or self-defeating process

The first of these motivations refers to *uncertainty*. When agents face uncertainty in their decision making, it would be rational for them to imitate others and to decide according to an observational learning process. In a strictly economic sense, Bikhchandani, Hirshleifer and Welch (BHW) (1992, 1998) have developed a model of herding behavior in which observation of others is the key criterion of (sequential) interactions. Agents are endowed by individual preferences taking the form of private information signals. These private signals are defined in a probabilistic sense, that is to say that agents always face an uncertainty on the result (the pay-off) they can obtain from their decision. One of the ways for agents to reduce this uncertainty is to observe the behavior of predecessors facing same situations. BHW show that under specific conditions, agents can converge quickly to conformity effects in populations, or short-lived fluctuations in which agents converge suddenly in same actions, such as fads or fashions. It's important to notice that at this stage this convergence process – the so-called informational cascades – rests on very little information, sometimes only the information represented by the private signals of the two or three first adopters in a community. In the well-known sociological approach of DiMaggio and Powell (DMP) (1983), uncertainty also appears as a strong source of mimetic interactions in the dynamics of collective behaviors. DMP try to capture convergence processes in decision through the concept of institutional isomorphism, which can be defined as the constrained process that forces an agent (an organization in their purpose) in a population to resemble the other agents that face a close economic or social context. DMP describe the process by which mimetic behavior appears as a rational response of agents to uncertainty, particularly in emergent organizational field. As a matter of fact, organizations such as firms can converge to same organizational practices – closely to our definition of cognitive proximity – according more to a mimetic processes than sometimes costly experimentations and explorations of organizational alternatives and their respective performance.

The second motive identified in the literature on mimetic behaviors and interactions refers to the legitimacy of individual decisions, and is closely linked to the first one. Essentially developed in sociology, this idea is also introduced in the model of BHW through the so-called "fashion leaders", that is to say agents who have such an expertise capacity and reputation that they can influence in the first period or during the process the trajectories of collective choices. It would be more legitimising to imitate other that we can infer that imitated agents are endowed by a strong reputation and legitimacy. Legitimacy is also a strong source of rational imitative behaviors in the works of Hedström (1998). It would be rational to imitate others with reference to the belief that imitation is a useful strategy for obtaining valued positions or resources, and by avoiding to be marginalized in communities. In a more institutional way of thinking, DMP insist on the fact that mimetic processes leading to institutional isomorphism is based on the argument that *"organizations tend to model themselves after similar organizations in their field that they perceived to be more legitimate or successful"* (p. 152). They put forward the idea that agents are more likely to follow the decisions of well-reputed others than to compute if these decisions enhance efficiency. Thus, with uncertainty, legitimacy appears as strong motives giving rise to collective behaviors and certainly something close to the above-discussed cognitive proximity.

The third motive explaining convergence in decision making through mimetic processes is linked to the question of coordination of economic activities in networks. Once again, sequentiality of decision making is a strong source of convergence in that sense that action of agents has always an influence on other agents. But now, the motives of imitative behaviors is linked to the benefits agents can obtain form their connection to a network. In economics, one of the most convincing approaches is represented by the Arthur' model of increasing returns to adoption (Arthur, 1989)[2]. In a formal way, models of increasing returns to adoption are based on the notions of network externalities. Pay-offs agents can obtain from their connection to a network are positively correlated to the number of previous connected agents. The basic idea is that the higher the number of connected agents will be, the higher will be the probability for the agent to communicate, exchange or capture information, in order to increase his satisfaction. However, this increasing satisfaction depends strongly on compatibility criteria governing interactions and communication between connected agents. For Arthur, theses problems of compatibility are essentially technological ones. But we can easily show and demonstrate that there could be also cultural or social, such as language, capabilities or knowledge (Vicente, Dalla Pria & Suire, 2005). Agents tend to imitate others not (only) because of uncertainty or legitimacy, but (either) because of interactions, communication and exchanges or transactions, in a closely sense of our definition of relational proximity. In sociology, this sort of network or relational effect in

[2]Orléan (2002), speaks about "preferential imitation" to qualify the model of Arthur, pointing the difference with the "informational imitation" of the model of BHW.

convergence in decision making is not clearly developed, at least in relation with mimetic behaviors. The only notable exception comes from DMP. They touch on this relation, noticing that normative pressure in organizational fields can be the result of professional networks, that is to say that firms tend to adopt similar practices in order to improve their *visibility* in networks.

Uncertainty, legitimacy, compatibility and coordination are thus strong sources and motives of mimetic interactions and can explain the emergence of collective behaviors. One of the most interesting extension requires to invest the complex relations between *individual* motives for imitation and economic properties of stability of *collective* behavior[3]. The key criterion which highlights these relations, in economics as in sociology, refers to the nature of the pay-off functions. For instance, In Arthur's model, as noticed by Geroski (2000), Orléan (2002) and Vicente & Suire (2006), the process of preferential imitation is based on an evolving pay-off structure. The pay-off are an increasing function of the number of agents which converge to the same choice. Through the network effect, the individual utility increases as the agents converge towards the same decision. Thus, the mimetic process which governs the emergence of the collective behavior engenders a strong stability in time and space (the so-called path dependency). At the opposite, when informational effect plays a major role through uncertainty, the intrinsic utility of agents and their pay-off are not affected by the behavior of others. One can even imagine that convergence process in decision can engender negative externalities, for instance when collective choices lead to congestion effects or to strong competing pressures. Thus, the collective behavior coming from informational cascade is fragile regarding to external or exogenous shocks or public information releases. BHW (1998) already identified these differentiated properties of stability when they noted that "*In many realistic settings, in addition to the informational externality described here, there are direct payoff interaction in a form of positive consumption of production externalities – sometimes called network externalities. The intuition here is that joining a network may help both the joiner and the others who have already joined. Uniformity is likely in the presence of network externalities. However, this uniformity does not display the fragility of an informational cascade"* (p. 168). In sociology, Hedström has also invested the intrinsic properties of stability of collective behaviors. According to him, mimetic interactions can exhibit different patterns of aggregate behaviors which depend on the nature of the evolving system of individual pay-off. On the one hand, we can suppose that convergence of behaviors is a pure self-fulfilling process, that is to say that agents, as in the Arthur's model, are in situations when the value of a particular decision is an increasing function of the number and the proportion of agents who have chosen this decision. On the other hand, we can also suppose that this convergence process is a self defeating process, that is to say that agents, closely to informational cascade models, are in situations when the value of a particular decision is a decreasing function of number and the proportion of agents who have chosen this decision. Hedström show that the nature of the evolving pay-offs system is the critical feature of the stability of the aggregate behavior. If a self-fulfilling process dominates, a sort of reinforcement process of beliefs occurs and agents converge to a norm. At the opposite, if a self-defeating process dominates, an erratic and cyclical aggregate behavior occurs, as in fads and success stories phenomenon developed by Strand and Macy (2001).

2.3. Rational imitation in clustering processes and proximities: some propositions

The following discussion links the nature of mimetic processes to the forms of emergent proximities, in order to propose some key determinants of the stability of clusters. Socio-economic and geographical proximities have been identified as structural properties of clusters. We have shown that it was necessary to explain how these proximities emerge as collective behaviors through sequential processes and decision interdependences, in order to overpass an analysis of clusters stability only through a functional typology of proximities. Now, the goal is to link these processes to our categorization of proximities in order to formulate some propositions on the stability and performance of clusters, which will be tested through a model and an empirical investigation in the next sections.

proposition 1:

[3]We define stability in a dynamical and evolutionary sense, i.e. a stability in performance and growth, and not the neoclassical stability property, strongly associated to a notion of equilibrium (Boschma and Lambooy, 1999).

A cluster will exhibit a stronger stability as the network effect prevails on the informational one in the co-location process.

This proposition can be justified by the evolving pay-off properties governing the convergence process of decision making. In the peculiar case of locational decision making, the intrinsic stability of clusters will depend to the balance of individuals motives to locate close to others. If uncertainty prevails on networking and direct interactions, firms converge to same location and gain in short term in legitimacy. But the collective pattern is fragile and sensitive to exogenous shocks, due to the non-evolving pay-off structure. At the opposite, when network effects prevail on the informational effects, geographical proximity is the result of a sequential process in which firms compare the benefit of each place according to their own preferences and the location of predecessors they consider relevant in their production and innovation process. The emergent network effect increases individual pay-off and the process can be strongly path dependant.

Several papers in regional sciences furnish some clear illustrations of the ambivalent properties of stability of clusters. For instance, the often-quoted work of Saxenian (1994) is strongly based on the role of networks of innovators and technological compatibility in aggregate performance of Silicon Valley ("*Silicon Valley is a regional network-based industrial system that promotes collective learning and flexible adjustment among specialist producers of a complex of related technologies*"). At the opposite, Appold (2005) develops an approach of clusters against the current of most of publications on this topic. According to him, agglomeration of innovative firms can emerge without supposing network effects or functional interdependences. Clusters can emerge and grow through mimetic isomorphism enhancing to legitimacy and creating a sort of "geographical charisma". Appold does not invest the question of stability but nevertheless mentions that this cumulative process does not necessarily increase the collective and organizational efficiency. The reasons of the stagnation period of Sophia-Antipolis at the beginning of 90s, identified by Longhi (1999), is a good illustration.

proposition 2:

A cluster will have more chances to emerge as the informational effect plays a major role in the first periods of the co-location process, reaching quickly the critical mass necessary to the network effect.

This proposition rises directly from the theoretical considerations of the last section. If the network effect enhances stability of collective behavior, one has also to consider that correlated positive feedbacks play in favour of attractiveness only after the achievement of a critical mass of first adopters. Before this critical mass achievement, the reversibility of trajectories can be always possible, that is to say that places compete each others in attractiveness. At the opposite, the informational effect plays in a different scale of time[4]. As a matter of fact, due to the strong assumption of uncertainty, agents can enter rapidly in a cascade, since their decision follows the public signal of few predecessors and so do not produce new informations for followers. Nevertheless, remember that cascades are fragile regarding small shocks or new entry of exogenous informations (Bikhchandani & alii, 1992). So, compiling propositions 1 and 2, if informational effect plays in favour of critical mass achievement in clusters, their stability is strongly associated to the ongoing network effect.

Proposition 3:

The informational effect will have more chance to play in favour of clustering process as the first firms can be identified as "fashion leaders".

If an informational effect is not a guarantee of stability of clusters (and so their ongoing attractiveness), it can play as a catalyst in convergence of location decision making when uncertainty prevails and legitimacy is required. This proposition can be reinforced by the role played by "fashion leaders". Following a fashion leader can decrease uncertainty on the pay-off of followers (Bikhchandani & alii, 1992), can attract them and increase the legitimacy of their decision (Granovetter, 1978; Dimaggio & Powell, 1983). Thus, the associated reputation of the first adopters is a key parameter of the collective choice trajectories, and of location trajectories for our purpose. For instance, Appold (2005) notes that *"a manager could conclude that the*

[4]That's why informational cascades are also used in marketing researches and practices.

number of successful laboratories at a particular site is an indicator of its productivity" (p. 21), without any other information on the intrinsic characteristics of the territories or the potential relations to be tied on the site. In the same lines, Caplin and Leahy (1998) have shown that the location of BB&B, a well reputed house materials retailer, in the depressed and under-use lower Sixth Avenue in New York, has engendered a rapid revitalization through the location of many other diversified retailers. According to them, after a delay necessary to the revelation of the success of this location decision making, many others have followed BB&B. And this is precisely this success revelation which constitutes the externality, rather than strategic or natural complements. The agglomerative process identified in the Silicon Sentier is close to this phenomenon (see below).

proposition 4:

A cluster will be more stable as the geographical proximity is coupled with a relational proximity

Combining propositions 1, 2 and 3, one can propose that the network effect at play in the convergence process of location decision making leads to relational proximity. And so, when geographical proximity is coupled with relational one, clusters emerge and exhibit appropriate conditions for innovation and dynamical stability. In that sense, geographical proximity is not a sufficient condition for knowledge externalities. Knowledges cross firms through relations in opened innovation systems in which technological convergence between complementary bits of knowledge is crucial to compete in monopolistic markets (Antonelli, 2005). One of the main characteristics of the successful clusters, earlier pointed by Saxenian (1994), refers to the relational density or thickness at work inside (and also outside) the clusters. Several formal explanations in economics has been provided during these last years. Their common denominator remains on the fact that cooperative advantages in knowledge creation have progressively overpassed the isolated strategies of firms and the excludability role of patents, especially during the exploration stage. For instance, Aoki and Takizawa (2002) develop a model on the determinants of the collective efficiency of Silicon Valley. They show that governance relationships between firms tend to favour technological innovations in computer industry through compatibility between interfaces and modularization which require information circulation and encapsulation. In the same way, Cooper (2001) investigates the relational dimension of innovative clusters through the question of job mobility. He shows that, in spite of the fact that firms always try to appropriate the benefits of their innovation, job mobility and resulting knowledge externalities can increase the overall rate of local technological progress without reducing the firm-level R&D expenditures. Once again, the "meeting" between complementary blocks of knowledge is the key factor of such labor market-based relationships. In sociology, one can also find a close result. For instance, Uzzi (1998) investigates the stability of network relationships compared to pure competitive ones. According to him, firms maintaining a amount of embedded relations in networks exhibit a lower rate of decline than firms maintaining only pure competitive ones, in particular in changing informational environments.

proposition 5:

A cluster will be less stable as the geographical proximity is coupled with a cognitive one

Combining propositions 1, 2 and 3, one can propose that the uncertainty and legitimacy effects at play in the convergence process of location decision leads to cognitive proximity. And so, when geographical proximity is coupled with cognitive one, clusters can emerge and display strong or chronic instability. We have shown previously that convergence in decision making based on uncertainty and legitimacy has an ambivalent outcome on pay-off. If legitimacy can increase at short term the pay-off, this is not the case at long term. According to Hedström, it is also possible that the convergence in decision making leads to a self defeating process. For instance, if we suppose, as we have done, that cognitive proximity refers to individuals or firms knowledge bases, the fact that knowledge could cross organizations can be in some prospects incompatible with a spatial gathering of firms in same territories (Boschma, 2005). In this peculiar situation, job mobility does not enhance the benefits of firms, because of the "unintended spillovers" such a job mobility can imply, as we have earlier observed in the particular case of Silicon Sentier (Vicente, Suire, 2006). Thus, if firms have been attracted by the gradual geographical charisma developed by a site, the emergent cognitive proximity that follows can create involuntary spillovers and a defiant climate which does not favour innovation and engenders instability.

The formulated propositions open perspectives that allow to enter in the black box of knowledge externalities. Because location decision externalities precede the knowledge ones, the weight of these later in the stability and the collective performance of clusters is strongly associated to (i) firms' motives and incentives to converge in a same territory; (ii) the existence of "fashion leaders" or more generally firms that can have a strong influence of the location decision making of other firms; (iii) the emergent forms of socio-economic proximities. These three parameters are thus key-ones that allow understanding clusters formation and stability, as shown by the following simulative model and illustrated by the following empirical evidences on two major ICT clusters in France.

3. A SIMPLE MODEL OF LOCATIONAL NORM STABILITY

Following the tradition between Sociology (Schelling, 1978; Granovetter, 1978; Hedström, 1998) and Economics (Dalle, 1997; Orléan, 2002), the aim of this section is to give a modelling representation to the above formulated propositions. The purpose is to capture the key parameters (mimetic pressure, "fashion leaders" and location decision externalities) that shape the locational norms emergence and insure (or not) their stability.

3.1. Individual decision under mimetic pressure

We propose a conditional decision making model in the line of Granovetter (1978). We assume that any given firms $i \in N$ have to make a norm-locational choice $\left(d_i\right)$ conditionally to the decisions of one or more other firms $\left(d_j\right)$ with $j \in N \setminus \{i\}$. Given a decision which can be described in two dimensions[5] : $D = \{0,1\}$ and $d_i \in D$, a conditional decision model posits :

$$\Pr\left(d_i = 1\right) = f\left(d_j\right)$$

Thus, if each decision is considered as a sequential and discrete point in time, the decision of firm i at time t depends at least in part on the decision of actor j at time $t-1$. As reminded by Watts (2006), Schelling (1978) and Granovetter (1978) have both argued that a binary decision framework may be much more general in part because many decisions *are* binary in nature and in part because more multi-faceted decisions can be effectively reduces to binary decision ; conforming to the majority norm vs choosing one of possibly many alternatives. To our purpose we retain 2 norm-locational choices.
Note that this formulation captures typically a global interaction structure. To say it differently, at each step time t, a firm observes all the sequence of $N-1$ decisions before to take her own decision.

3.1.1 Conditional strategies

Mimetic location decision developed in the previous section can be defined as conditional strategies. To take that into consideration, we propose that for every firm $i \neq j$, let $\overline{d}_{j \neq i} = \left(d_1, \ldots, d_{i-1}, d_{i+1}, \ldots d_n\right) \in D^{N-1}$ be the action profile representing the behaviour of the remaining individuals in the population. We can define a function $P_i : D^{N-1} \rightarrow [0,1]$ such that $P_i\left(\overline{d}_{j \neq i}\right)$ is firm *i* 's probability of choosing 1-norm location, given the strategies $\overline{d}_{j \neq i}$ of remaining firms such that $P_i\left(\overline{d}_{j \neq i}\right) \in [0,1]$ in a case of continuous probability.

3.1.2 Heterogeneity and local interaction structure

If limited rationality is assumed, one has to reconsider this stochastic behaviour in the light of local interaction structure (Kirman, 1997). Indeed, except some emergent territories with very few firms located, many cluster are more or less dense. Thus, it is reasonable to assume that new entrants can not rebuild the historical sequence of discrete location, because of a lack of cognitive capacity or simply because public information is not available.

[5] One have to note that an extension to a more strategies based models does not modify our qualitative results

Following David (1988), among others, we introduce a relevant neighbour principle or interaction neighbourhood in order to model the limited rationality of firms and in a certain way, be considered as one of the idiosyncratic characteristics of firm i :
Following Watts (2006), we consider a function p_i denoted as *influence response function* such that :

$$P_i\left(\overline{d}_{j\neq i}\right) = p_i\left(k_i\left(\overline{d}_{j\neq i}\right)\right) \in [0,1]$$

Where k_i is the level of *decision externalities* in the words of Watts (2006) or the neighbourhood influence on the decision of i 's firm and is defined as follows :

$$k_i\left(\overline{d}_{j\neq i}\right) = \sum_{j\in N\setminus\{i\}} d_j$$

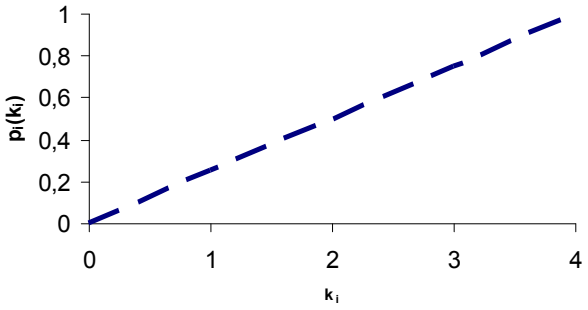
in order to keep our model simple, we restrict ourselves to a 2 dimension graph interaction[6] and a von Neumann neighbourhood in such a way that the decision of each firm i is conditional to the decision of 4 nearest neighbours and by consequence, the level of externalities can only be $k_i\left(\overline{d}_{j\neq i}\right) \in [0,1,2,3,4]$[7]. Thus each firm can receive a signal or a decision externalities that can varies from 0 where there is no pressure to adopt the 1-norm location to 4 where all the firms belonging to the interaction neighbourhood adopt the 1-norm location. In this last case one can consider that the probability to switch to alternative norm location is very high.

3.1.3 Form of influence response function

We can compute different $p_i(k_i)$ in order to simulate different kind of behaviour rules regarding the decision of neighbourhood. Reminder that $p_i(k_i)$ is the probability for firm i to adopt the 1-norm location when exactly k firms within the neighbourhood adopt the 1-norm location strategy. In this paper we have considered only the case of positive externalities. Of course, there exist main situations where territories are characterized with negative externalities or diseconomies of agglomerations related to congestion effect and further work will consider this case. The positive externalities simply mean that the higher the overall number of adopters of 1-norm location, the higher the probability of adopting 1-norm location. We can represent many different behaviour rules with two polar deterministic cases :

Case 1 : A linear increasing probability means that the probability of a firm i to adopt 1-norm location increasing monotically with the diffusion of this strategy within neighbourhood.

Figure 2 – Conditional and linear behaviour



A more convinced specification is to consider a threshold model a la Granovetter (1978). Thus, firms can "wait" for a more or less long time that initial dominated strategy diffuse into the neighbourhood before adopt it. Many documented situations can be interpreted in that way and among others, traditional

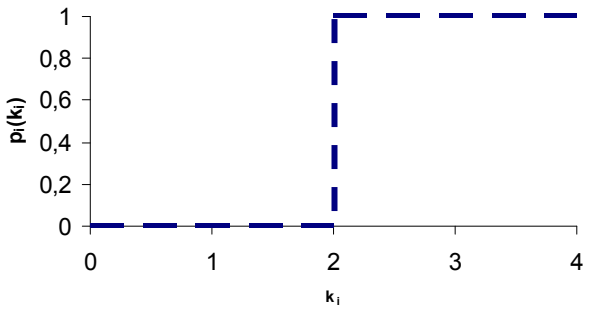
[6] Firms are located on a torus in Z^2.
[7] Watts (2006) names this function, the *social signal*.

Granovetter's model (1978) of collective riot, the informational cascades of BHW, or rational imitation model of Hedström (1998).

Case 2 : A threshold behaviour means that below a threshold of diffusion $\left(k_i^T\right)$ of alternative strategy, firm i does not adopt the 1-norm location. Thus, strategy 1 is chosen iif $k_i \geq k_i{}^T$.

Following figure represents a case where $k_i^T = 2$ means that below 50%, the firm i does not switch to 1-norm location : $p_i\left(k_i\right) = 0$ and switch with probability one : $p_i\left(k_i\right) = 1$; as soon as 2 firms are playing the 1 norm-location strategy.

Figure 3 – Conditional and threshold behaviour



Finally we can also consider a strictly non deterministic influence response function in order to capture less naïve behaviour. In that way we impose only two conditions to $p_i\left(k_i\right)$:

Assumption 1 : $p_i\left(k_i\right) \in [0,1]$

Assumption 2 : $p_i(0) < p_i(1) < p_i(2) < p_i(3) < p_i(4)$ to capture an increasing positive externalities relating to cumulative interactions.

Finally, as our model is symmetric we have also $\begin{cases} p_i(3) = 1 - p_i(1) \\ p_i(4) = 1 - p_i(0) \end{cases}$ and by consequence, it remains three critical parameters $\left\{p_i(0), p_i(1), p_i(2)\right\}$ to conduct different scenarios presented in the next point.

3.2. From individual adoption to collective diffusion of d -norm location

If we imagine a stable collective belief system where each firm adopt the 0-norm location, an unconditional behaviour with a non null probability is necessary in order to start the mimetic process.

Assumption 3 :

There must be at least one or few firms willing to adopt the alternative norm in order to mimetic process begin : $p_i(0) > 0$.

A corollary of this assumption 3 is that a probability $p_i(1)$ non null is necessary in order to contagion, diffusion, cascade or snowballing effect will engage.

Assumption 4 :

The influence response function $p_i(1)$ indicates both the speed of contagion or mimetic process *vis a vis* first adoption and the weight of "fashion leader".

Finally, we can consider that the couple $\{p_i(0), p_i(1)\}$ models both the probability of *pioneer's* behaviour as well as the credibility of this *pioneers* trough the influence of this behaviour to the decision of followers.

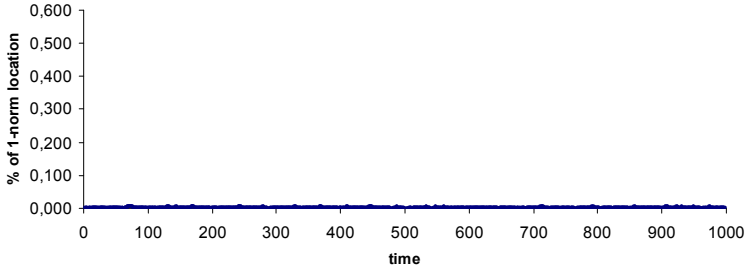
Our simulation protocol has always been used in literature (Dalle, 1997 for example) and is strictly similar to Schelling (1971) one's. The dynamic of collective diffusion is obtained by drawing at each time step one firm from a population sized N whose adoption probability, as a function of his neighbourhood, is then given by $p_i(k_i)$. This stochastic interaction model is finally a sequential and cumulative action model.

Now some different simulated scenarios can be proposed.

- Case 1a : few first pioneers and weak contagion

Firms are indifferent between both norms when there are equally distributed within the neighbourhood: $p_i(2) = \frac{1}{2}$. The absence of network effect because of a lack of relational proximity can justify this parameter. Besides, the $p(0)$ and $p(1)$ needs to be low in order to simulate this scenario.
Then, the parameters are , $N = 2500$, $\{p_i(0); p_i(1), p_i(2)\} = \{0,002; 0,04; 0,5\}$
The following figure is representative of numerous simulations over $t = 1000$

Figure 4 - few first pioneers and weak contagion

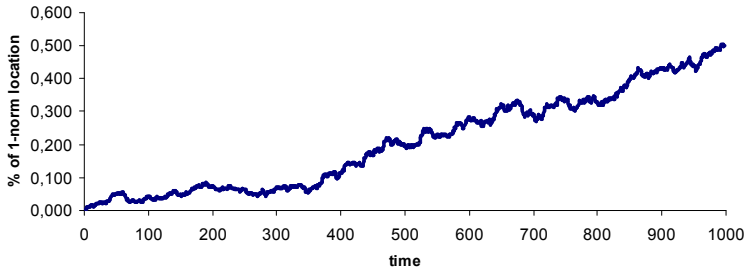


Conjecture 1 : In the case of indifference between both norms, when the pioneers firms are few present and mimetic process quasi non existent, the alternative norm location never diffuses through population. The initial equilibrium remains stable

- Case 2a : few first pioneers and high contagion

The parameters describing this situation are similar to case 1 except $p_i(1) = 0,26$: $\{p_i(0); p_i(1); p_i(2)\} = \{0,002; 0,26; 0,5\}$. It means that "fashion leaders" or pioneers firms are now more weighted. As presented in the previous section, the presence of an informational externalities can explain the modification of $p_i(1)$.

Figure 5 – few first pioneers with high contagion

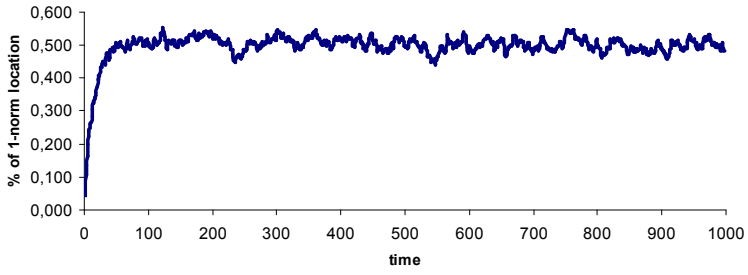


Conjecture 2 : Ceteris paribus, the presence of strong fashion leaders in the sequence of adoption speed up the process of collective diffusion of norm

- Case 3a : many pioneers firms and high contagion

The parameters describing this situation are $N = 2500$, $\{p_i(0);p_i(1);p_i(2)\} = \{0{,}11;0{,}26;0{,}5\}$.

Figure 6 – Numerous pioneers with high contagion

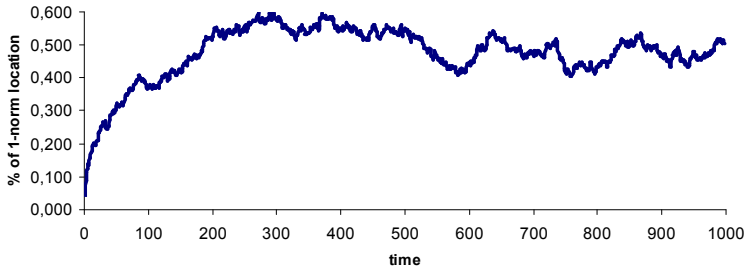


Conjecture 3 : In the case of indifference between both norms, when the pioneer firms are numerous and their legitimacy is high, the alternative norm diffuses very quickly but the collective outcome never converge to a stable equilibrium.

- Case 4a : many pioneers firms and weak contagion

The parameters describing this situation are similar to case 3a except $p_i(1) = 0{,}15$: $\{p_i(0);p_i(1);p_i(2)\} = \{0{,}11;0{,}15;0{,}5\}$.

Figure 7 – Numerous pioneers with weak contagion



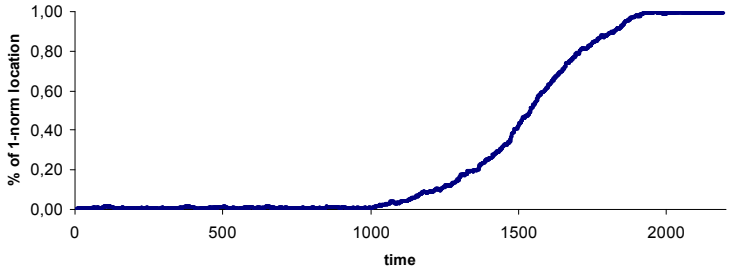
Conjecture 4 : Ceteris paribus, in the case of indifference between both norms, when the firm pioneers are numerous but mimetic process relatively weak, the alternative norm diffuses more slowly and the collective outcome never converge to a stable equilibrium.

Now we consider that when a firm has to choose between both norm locations, convergence to the dominant norm is an increasing function of the individual pay-off. Typically, the existence of network effect based on relational proximity conducts to this decision. The influence response function $p_i(2)$ is now strictly superior to $\frac{1}{2}$. The two following simulations have been done with $p_i(2) = 0{,}6$.

- Case 1b : few pioneers firms and weak contagion

The parameters of this scenario are : $N = 2500$, $\{p_i(0); p_i(1); p_i(2)\} = \{0{,}002; 0{,}11; 0{,}6\}$, and $t = 2200$

Figure 8 –few first pioneers and weak contagion

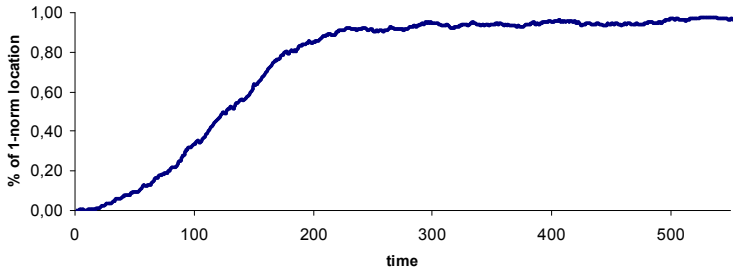


Conjecture 5 : It takes a very long time to alternative norm location to diffuse through population, but the collective outcome is highly stable.

- Case 2b : few first pioneers firms and high contagion

The parameters describing this situation are similar to case 1b except $p_i(1) = 0{,}26$. $\{p_i(0); p_i(1); p_i(2)\} = \{0{,}002; 0{,}26; 0{,}6\}$, meanings that “fashion leaders” are now more weighted.

Figure 8 - few first pioneers and high contagion



Conjecture 6 : The co-existence of increasing returns to adoption and strong fashion leaders speed up crucially the diffusion of alternative norm location. The final equilibrium is highly stable

The following table proposes a recapitulating synthesis of the 6 conjectures, linking each scenario with the propositions previously done.

Table 2 – Correspondences between porposition and conjectures on the link between mimetic pressure, emergence and stability of locational norms

	Conjecture 1	Conjecture 2	Conjecture 3	Conjecture 4	Conjecture 5	Conjecture 6
Proposition 1						
Proposition 2						
Proposition 3						
Proposition 4						
Proposition 5						

Combining propositions and conjectures, one has to stress of the fact that the stability and the collective performance of clusters are highly sensitive both to the type of mimetic pressure to converge in same territories and to the role played by the so-called “fashion leaders”. The following section gives an illustrated interpretation confirming these findings, by focusing on the links between the stability of two main French ICT clusters, their historical co-location process and the resulting socioeconomic proximities

4. SHORT EVIDENCES ON THE FRENCH CASE

The French technological landscape proposes two contrasted illustrations of the theoretical elements that we previously brought to light: the science and business park of Sophia Antipolis and the Parisian “Silicon Sentier”[8].

4.1. On the formation of clusters: from the arrival of pioneers to the emergence of a locational norm

The science and business park of Sophia Antipolis, officially created in 1969 in the southeast of France (between Nice and Cannes) on Pierre Laffitte's initiative, today extends on a 4800 hectares area and counts

[8]The objective of this part is to provide a very stylized illustration of the studied phenomena. The conditions of emergence and the respective properties of stability of these two clusters are developed in detail in Dalla Pria (2005) and Dalla Pria, Vicente (2006). The complete empirical investigation was carried out on the basis of about fifty interviews for each clusters

around 1300 organizations and 25000 employees. Two periods have marked the development of Sophia Antipolis. From the beginning of the 1960s until the end of the 1980s, the history of Sophia Antipolis was especially characterized by an external accumulation logic, based on attractive initial conditions and an intensive policy of international marketing promoting the site for R&D activities. *"It was in fact the outcome of small events occurring during the 1960s, notably the establishment of a IBM research centre near Nice, followed by a similar move by Texas Instrument, which afforded credibility to the idea of a new mode of industrialization for a region previously totally dependent of tourism. This idea was that sun and sea could attract enterprises in research and leading-edge technology. (...) The commercialization strategy for the park has been based on a major international marketing effort, mainly directed to the US"* (Longhi, 1999, p. 334-335). During this period, numerous companies and academic organizations arrived within the cluster but they were working independently from each other. Since the beginning of the 1990s, after a stagnation period in the accumulation process, the functioning of the cluster was marked by the development of synergies between the organizations located within it, which resulted in the progressive stabilization of an efficient collective organization of work regarding economic and technological dynamism.

The "Silicon Sentier", located in the heart of Paris, represented another symbolic territory of the French net-economy. But unlike Sophia Antipolis, this cluster was not a historic location area for technological activities. Its genesis began in 1998 with a phase of very fast development in the course of which numerous start-ups came into the district known under the name of "Sentier", renamed "Silicon Sentier" by analogy with the New York Silicon Alley and the Californian Silicon Valley. At this period, 300 start-ups arrived in this cluster and strongly contributed to the construction of a location norm or "signal location", which provided them in return with the legitimacy that was lacking to them because of their recent creation.

> *"There were effects of mode which consisted in saying that one was in the* Sentier*"* (Start up founder)

> *"In the* Sentier*, there were mythical places: the main office of Free or Spray, we have done the same, we took rotted offices in* rue de Turenne *to arrange them"* (Start up founder)

Nevertheless, this success story was only of short duration since after the explosion of the Internet bubble in 2000, the image of the district was tarnished both by the bankruptcies of numerous local start-ups and the relocation of others. The Silicon Sentier then underwent a fast decline which confirmed afterward since this territory still suffers from a very bad reputation. Some people even called it "Silicon Desert".

The trajectory of development of these two clusters thus tends to validate the first three theoretical propositions that we formulated previously. Indeed, the emergence of the Silicon Sentier was not only made possible but also accelerated by the influence exerted by the initial location choices of "fashion leaders" in the sector such as Yahoo France or Lycos: their choices, based on the intrinsic attraction of the territory (very low rents, access to high quality connections and urban amenities) actually strongly influenced the later trajectory of development of the cluster by generating mimetic behaviours on behalf of many other start-ups in search of legitimacy. In Sophia Antipolis, on the contrary, the arrival of IBM, Alcatel and Texas Instrument near the science park in the early 1960s, before its official creation, had little determining influence on the other actors of the sector. The accumulation process thus remained quite slow since this cluster only reached the critical mass for the development of productive interdependences in the late 1980s, ie approximately 20 years after the first arrivals[9]. So the informative effect was limited whereas the network effect dominated, insofar the location choices were mainly based on considerations of complementarities in activities with the actors already located within the cluster. Because of this slow development, the Sophia Antipolis project was long regarded as a "semi failure", until it became a real success story after the late 1980s10. The study of these clusters thus lies the stress on the fact that the existence of an informational

[9] The number of academic and industrial organizations in Sophia Antipolis increased from 125 to 752 between 1982 and 1990 and was around 1300 in 2003. During the same period (1982-1990), the number of employees increased from 3700 to 12086 and it reached 27000 in 2003 (source : ***www.saem-sophia-antipolis.fr)***.

[10] If it is not to be rejected, the idea of a critical number of organizations or jobs beyond which productive interdependences would mechanically develop is not precise enough to enlighten the complexity of the mechanisms that underlay the transition of Sophia Antipolis from the middle of the 1980s. According to Longhi (1999), the relocation of an antenna of the University of Nice within Sophia Antipolis constitutes the main explanation of this phenomenon. Two additional reasons at least can be advanced: the creation of numerous professional associations

effect during the first stages of the accumulation process actually tends to favour the emergence of a cluster *(proposition 2)* but also that this informational effect has all the more chances to play a major role that the pioneers are identified by the rest of the population as leaders, like in the Silicon Sentier *(proposition 3)*. However, accumulation processes only grounded on an informational effect are obviously more unstable than those based on the existence of a network effect, which are generally, in spite of their slower rhythm of development, more durable and less sensitive to exogenous shocks *(proposition 1)*.

4.2. On the heterogeneity of socioeconomic proximity: relational proximity versus cognitive proximity

The form of the location and the accumulation process that underlay the emergence of these two clusters can engender differentiated stability properties in time. The differentiated dynamics can be also explained by the nature of interactions between local organizations. This second question thus directly refers to the difference between geographical and socioeconomic proximity, whatever are the forms of the latter.

As we already noticed, the distinction between geographical and socioeconomic proximity is especially relevant in Sophia Antipolis. The history of this cluster is indeed marked by a turning point at the end of 1980s, characterized by the change from a compartmentalized functioning, in which local organizations coexisted without maintaining any relations, to a functioning based on the development of collective dynamics and synergies between these organizations, which refer precisely to the form of socioeconomic proximity that we named *relational proximity*. From this period on, we actually notice the progressive emergence of an organizational model founded on the existence of various forms of division of labour between institutional actors, service providers and technological actors, whose skills were sharply differentiated. At first, this strongly decentralized mode of integration makes it possible for each actor to delegate the subordinate activities to dedicate to its core business. In return, each of them can benefit from the expertise of the others and can regard them as potential commercial outlets. So, the structure of local interactions is at the origin of the creation of interdependences between organizations facing logics of technological compatibility in a fast changing economic and technological environment. We propose in the following lines two illustrations of these interdependences.

The first illustration can be found in the relations between local companies. These relations, which are actually based on a double logic of technological compatibility and complementarities, can take various forms. And these forms, as already noticed by Cooke (2006), depend to the distinctive phases of exploration, examination or exploitation of knowledge. In a bilateral perspective, they can lead a big company to integrate applications or technological innovations developed by local start-up into its own products (through incubation, outsourcing or more spontaneously).

> *"The start-up within our incubator develop applications and we test them on our multimedia platform. The start-up remain the owner of their application but we add a service to our range. They thus become applications "start-up X - [our company]". [...] The interest is to add products to our portfolio and applications on our platform". (Big company incubator)*

> *"Service companies around Sophia Antipolis provide us with skilled employees when we do not want to engage: it is a very positive point for me! For example, 3 years ago, we had no Java skills: thanks to them, I found some. Today, we have the same problem with SAP. These companies represent additional human resources for the situation we did not anticipate! They all are local companies because their employees frequently work with my teams". (Big company leader)*

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from the end of 1980s (Leaders club, 1989 ; Telecom Valley, 1991 ; Hi-tech club, 1992 ; Persan club, 1993 ; Data base forum, 1994 ; Java users club, 1996 ; Sophia Start-up club, 2000 ; Business Angels et Intech clubs more recently) and the redundancy plans organized in the early 1990s by several local companies, which developed social relations and networks by spreading dismissed employees in other local companies (Thomson Sintra, 300 employees in 1991 ; Digital Equipement, 420 employees in 1991 and 240 in 1993 ; Matra Communications, 100 employees over this period).

But they can also involve two start-up that became aware of potential synergies between their business or technology.

> *"We developed 3D conception applications on computers: we still draw architectural plans but we integrate 3D images. [Local start-up A] was interested and lent us tools so that we can show them what we can do. We worked on one of their CD-ROMs to show them. We do consider that [start-up A] will be the standard of tomorrow. They allowed us to use their software free of charge and we frequently meet their leaders: we say to them how we would like their software to evolve and they listen to us carefully. […] When we are asked to do something that goes beyond our skills or that is not related to our core business, we subcontract to partners. If we have a project but we do not know how to answer, we call a partner to help us on the proposal. That is exactly what we did with [local start-up B]: they worked on the catalog and on the Flash part and we worked on the animation part on a CD-ROM for [big company]. All this is quite informal: we get the right to use free of charge a company technology (like [start-up A]) to develop prototypes, and later, the prototype can be used by this company for demonstrations. This is the reason why we get closer to [start-up A], to fill a technological hole! Idem with [start-up B]". (Start-up leader)*

In a multilateral perspective, these relations can emerge within the framework of collective projects. For instance, this is what happened in Sophia Antipolis through the Knowledge Management Project (KMP) who gathered local actors around the question of the social uses of locally developed technologies.

> *"We develop very powerful technologies (UMTS) and we sometimes wonder about the way to use them, about who is going to use them. The objective of the Knowledge Management Project is to know eachother better, to develop a base of activities to know with whom we can work". (Big company leader)*

The second illustration lies in collaborations between companies and academic research laboratories. These collaborations allow the manufacturers to deal with too sharp technological problems so that they can handle them by themselves. For instance, they can subcontract theoretical researches unrelated with their core business or too expensive developments to be internally realized with laboratories specialized on similar technologies.

> *"We are more and more in demand. Recently, Bull came to us because they wanted to validate the respect for confidentiality on a product (there was information related to different companies on the same smart card)." (Academic research laboratory)*

As for research laboratories, relations with private companies allow them to obtain PhD scholarships but also to supply job outlets to their young doctors.

> *"PhD scholarships are a good way to collaborate with private companies. They actually do not require a strong investment on behalf of the company who can recruit the PhD student mastering the tool." (Academic research laboratory)*

In addition, these relations enable them to obtain funds through subcontracting contracts or joint propositions to public calls for bids. These funds make it possible to start researches which could not be led otherwise.

> *"We make contractual researches for companies: 50 % of the financing of our labs (wages included) come from contracts with companies. In these labs, there are PhD and Master degree students." (Academic research laboratory)*

Eventually, relational proximity turns out to be the major form of socioeconomic proximity in Sophia Antipolis. Following *propositions 1 and 4*, its collective efficiency, based on networks and relational assets, makes the cluster attractive as well for candidates for a location than for endogenous growth through spin-offs and SME emergence.

In the Parisian cluster, on the contrary, the socioeconomic proximity never appeared through the form of a collective organization of work based on differentiation and complementarities between local organizations. The *cognitive proximity* proceeding from the locational cascade is the main characteristics of the Silicon Sentier. This cognitive proximity exhibits a double dimension: firstly, the strong similarity of knowledge, skills and activities (products and markets) between local start-up; secondly, the collective identity of the "Silicon Sentier" community.

The *first form of cognitive proximity* between local start-up is based on similarities on the couple valued skills / relevant market. Most of these start-up were indeed built on business models related to the Internet and were thus operating on very close markets. As a consequence, the founders were incited not to reveal their project in order not to be imitated by potential competitors.

> *"We made errors because we tried not to reveal a concept which was in fact already known. We should have contacted big companies earlier." (Start-up founder)*

In addition, local start-up were seeking similar knowledge and skills, which provoked a strong competition in the recruitment of the most efficient employees, competition that was even increased by the scarcity and weak visibility of skills between 1998 and 200111.

> *"At this period, start-ups were swiping employees from each other. CEO12 did not want to send their employees to represent the company to the First Tuesdays because they were courted by other CEO." (Journalist)*

At last, a competition existed until 2000 that aimed at drawing the attention of venture capitalists, who invested at that period a lot of funds in the net-economy start-ups.

> *"It is very true in the Silicon Sentier: when a venture capitalist turns up at the corner of the street, there are not friends anymore." (Lawyer)*

In this particular economic context, a culture of secret and confidentiality as well as a tendency for exaggeration appeared in the Silicon Sentier cluster, which made exchanges or collaborations between start-up particularly unlikely.

> *"There is a pervading paranoia and networks are all the more difficult to develop. For instance, a start-up specialized in coaching and other marketing services for start-ups created a web site providing the start-up with all the marketing resources existing on the web. They wanted to make that in a collaborative way. After one year, they realized that the collaborative behaviours were inexistent." (Local public authorities)*

> *"There is a lot of hypocrisy, of bluff, of marketing, of wind. That is part of the game. For instance, people say "there are X visitors on my web site" while there are four times less." (Start-up founder)*

> *"We developed partnerships Internet with Lycos, Caramail, Chez.com: We remunerate these sites according to the purchases which they involve on our site. But we were mistaken because these partnerships do not go." (Start-up founder)*

So, the Silicon Sentier cluster presented very few similarities with the traditional image of a technological cluster: no or few synergies and complementarities between local organizations, strong competition, distrust respect to the other members of the cluster, etc.

However, the competitive and suspicious climate did not impede the development of multiple social interactions within the start-up population. And these social interactions were at the origin of the *second form*

[11] At that period, there were no recognized trainings for several web jobs like HTML developers, web designers and programmers.
[12] Chief Executive Officer, ie company leader.

of cognitive proximity that was grounded on the fact that the founders and employees of local start-up shared the same fundamental values of the net economy: rejection of the traditional economy bureaucratic organizations and apology of a new conception of work that can be named "funky business" (or "social business"), based on the autonomy in the work, considered as a passion, and on the weakening of the demarcation between private and professional life. This vision of the world was concretely embodied in informal but constraining norms founded on the refusal of various behaviours considered as sacrilege. The first norm refers the rejection of the idea of control of work but also of behaviours – consumption of cannabis and circulation of pornographic images were very usual things.

> *"Everybody pisses out of your schedules: you can arrive at 9 am or 11 am, leave at 7 pm or 11 pm, play the video games, work with a walkman and wear the clothes you want. The only thing is that you have to complete your work. From 8 pm on, you can smoke and roll joints." (Start-up employee)*

Second norm, the start-up employees were supposed to be considered as equals and the idea of hierarchy was rejected. For that reason, the hierarchical authority was not considered as an acceptable mean to urge someone to do something.

> *"You must not act as a chief, especially with the HTMListe, even if you are his chief. Otherwise, he is going to say that you patronize him. You have to treat him as an equal even if there is a difference of wage and status. In project manager, there is "manager" and they do not like that word." (Project manager)*

At last, a refusal of the careerism was clearly assumed. The members of the Silicon Sentier declared to do their job by passion and not with the aim of seeking a fulgurating career.

> *"I have proposals for jobs with a 800KF wage. But money is not a purpose in itself for me. I like my job here. There are no opportunities for an evolution of my status and I do not want to take the job of somebody else." (Start-up employee)*

In everyday life, the diffusion of these norms and values, which guaranteed the cohesion of the Silicon Sentier cluster and made its community functioning possible, was favoured by the existence between the start-up of "coalescing" interactions. So the parties organized by professional associations or by start-ups to celebrate a fund raising, an important contract or just to be known, were all the more valued as they were considered as a significant manifestation of the conception of work claimed by the start-up employees themselves: the "funky business".

> *"There were numerous parties to celebrate events (fund raising, launching of a new product). It was networking. And it was important because when we were in bars, it was the only moment when we could speak together!" (Start-up founder)*

In addition, the start-up managers and employees often met each other in local bars and restaurants at lunch time or after work. Finally, the numerous parties organized within the Silicon Sentier played a major role in the cohesion of the start-up community. They indeed encouraged its members to meet and to know each other and then to adopt an endogenous way of life. For that reason, they strongly contributed to maintain and to strengthen the collective identity of the Silicon Sentier by reinforcing its "clanic" tendencies.

> *"The parties took place in bars or in offices… They were big social events, very fashionable but also relax (jeans, etc.) with a lot of alcohol. There was a lot of chatting up in the companies and in the industry. People thought that they were creating a new way of working. They were arrogant. I had the feeling to be a club member. And I dated someone who belonged to this world. People worked like possessed and after, they spent the night together." (Recruiter specialized in net economy)*

So, the originality of the Silicon Sentier community lies in the striking contrast between the competition climate stemming from the similarity of core businesses and required skills on the one hand, and the sharing of common beliefs on the other hand. For that reason, this cluster presented an unexpected social structure

since it gathered organizations who maintained *simultaneously* competitive and coalescing, conflicting and friendly interactions. Concretely, its cohesion was based on similar norms of behaviour and management practices, which spread within the community and hardened to become "taken for granted" (Goffman, 1973) and constitute the basis of the cluster collective identity. This collective identity then partially uncoupled from the endogenous economic and social exchanges to favour the mediatization, and then the "labellization" as "Silicon Sentier", of the cluster.

4.3. Socioeconomic proximity and technological clusters stability

on one hand, the cognitive proximity identified in the Silicon Sentier is founded on a logic of similarity characterized by the convergence of organizational and management practices and of perceptions and believes. The start-up located within this cluster indeed shared a set of representations and practices characteristic of the infomediation economic sector. But simultaneously, the productive interactions between them remained nearly non-existent since these organizations had similar business models and were often in competition on very close markets. So, in spite of the collective identity and the label "Silicon Sentier" claimed by the start-up themselves, the lack of productive interdependences did not favoured the coordination and the development of complementarities between them and thus weakened the cluster. In other words, the weakness of relational proximity within this cluster made him particularly vulnerable to informative exogenous shocks. This last remark explains why the Silicon Sentier did not survive the explosion of the Internet bubble: it indeed brutally declined and almost disappeared in a few months after 2000. Such a dynamics is clearly illustrative to the combination of *propositions 2* and *5*

On the other hand, the existence of a relational type of socio-economic proximity, based on the existence of productive interdependences and complementarities between local actors, strengthened the stability of Sophia Antipolis by making individual strategies of relocation not only expensive but also less relevant. For that reason, Sophia Antipolis survived the net economy crisis and still benefits from a sustained development. It constitutes thus a convincing empirical validation of the combination of *propositions 1* and *4*, confirming that relational proximity tends to strengthen the stability of clusters.

5. CONCLUSION: FROM THE GEOGRAPHICAL CHARISMA TO THE LOCAL RELATIONAL ASSET

Following this demonstration, we confirm that the stability and the collective performance of clusters strongly depend on the nature of the cumulative process of location and the resulting socio-economic forms of proximities. Thus, prior to the role played by local knowledge externalities in the regional performance, location decision externalities play also an important role. Beyond the geographical charisma that some clusters in the world exhibit (often labellized by Silicon ... or ... Valley), the relational density and the benefits that the firms obtain thanks to their proximity remain significant for the stability and the aggregate performance at the regional level, in particular when the logics of compatibility, standardization and modularity exceed the pure logics of appropriation of knowledge So cognitive proximity, whatever it concerns the knowledge bases, the nature of markets or the modes of social regulation (and the resulting strong collective identity), is far from being a guarantee of the collective efficiency of the clusters. Nevertheless, we have stressed on it, cognitive proximity influences strongly the dynamics of agglomeration because of the weight of uncertainty and the legitimacy firms can obtain when they are co-located in fashionable clusters. But the fast growth of some of these clusters cannot be explained by knowledge externalities, at least by local ones, because of the few exchanges and transactions on knowledge. The growth of this type of cluster is thus much more the result of a informational mimetic process that one of a form of endogenous growth due to a collective organization of the production of knowledge. In this case, we have shown that the dynamic stability is less insured and the anchoring of the firms weaker.

To stress the role played by the location decision externalities prior to local knowledge externalities engenders new prospects for forthcoming researches. For instance, between theoretical analyses and empirical studies, the question of the measurement of the aggregate performance of the clusters requires to develop new data, qualified here of relational data. The one individual data on the performance of the firms, and their aggregation, are not any more suitable for the evaluation of the performance of clusters. For

example, the data of patents can have an ambivalent interpretation within the framework of our analysis. On one hand, these data, whatever their limits, are a good indicator of the degree of innovation observed in an area at a given time. But on the other hand, these same data can be also studied under the focus of the cognitive proximity. In this case, a regional concentration of patents belonging to same classifications leads us to predict a too strong degree of cognitive proximity, and sometimes thus a too strong competing pressure, or a climate of mistrust from which the "involuntary externalities" already identified by Boschma (2005) rise. Conversely, these same data could be used to identify a local relational density, when are taken into account the complementarity of the codes of classification in the framework of emergent technologies, the co-patents, or the names of the inventors in the citations of patents in order to reconstitute the social networks of innovation. Other relational data can also be built, on the basis of financial relations between firms - cross participations, joint ventures and common plants for instance. These perspectives will be developed in the works to come with the aim of completing and confirming the propositions formulated in this work

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